slight degree too small. The value of x given above will, there-fore, be understood to apply to the atmosphere in its mean state. Of the other cases of discordance, April 21, May 30, and May 31, I have no explanation to offer, except that the two last were scarcely so satisfactorily observed as the average of the measures.

Durham Observatory,
  1873, August 13th.

Note on Logarithmic Tables. By Col. Tennant.

I have been glad to see that Mr. J. W. L. Glaisher has brought forward the necessity of some authority to superintend the publication of Mathematical Tables. I have long felt the want. Some such arrangement is necessary, not only to secure accuracy, but to allow the price to be reduced as far as possible.

Mr. Glaisher's researches have only extended as yet to logarithms of numbers, but those of circular functions are fully as important, and in offering a few suggestions, I propose to assume that both will be published and dealt with in the same manner.

It seems to me absolutely necessary that the second of space should be the difference of argument of the Tables of Circular Functions, and that the book of Tables should not be of enormous size. The labour of using Taylor's Tables is very great ; Bagay's are not clearly printed, and the volume has a mass of matter in it which adds to its cumbrousness. I believe that for ordinary use seven figures are enough, and I know of no tables which approach Shortrede's, whether for convenience or accuracy. It is the custom in the Indian Survey to compute in duplicate with different sets of tables ; in my experience Shortrede's were always preferred by the computers, and I believe that when corrected up according to the list of errata in vols. xxiv. and xxvii. of the *Monthly Notices,* they will be found singularly convenient and singularly accurate. I have never found the nokta inconvenient ; it serves to mark the place where the third figure changes, and one knows instinctively that all the logarithms which follow in the same line have the first three figures following in the Table of Numbers, and at the bottom of the page in those of circular functions. In fact, it is only one nokta which is wanted. The figures are rather crowded, especially in the cir-cular functions ; but it is impossible to avoid this without increasing the size of the page, and incurring more inconve-nience. I think if it were seriously proposed to publish standard 7-figure tables under authority, I should prefer to see Shortrede's taken as the pattern ; and I offer the following suggestions as to improvements, in the hope that they might be found useful :—

First, if the stereotype plates now in existence be not used, and the tables be set up again, I would strongly recommend a more

uniformly thick figure ; next and last of general suggestions, I would propose a better paper, and that the size should be rendered unchangeable. It is very difficult to correct on unsized paper, except with a pencil, and equally so on a book which has been printed on such paper as has been used for Shortrede's Tables.

I think the following changes would be improvements :—

First, the circular arcs should be modified in the logs. of numbers. For this there are two plans. The indices in the first nineteen pages might be reduced by one, and the arcs throughout divided by ten. This would be generally more convenient than the present arrangement. A second plan would be to remove the indices in the first nineteen pages, which are not really necessary; the present arcs might then stand, and if the minutes corresponding to the tenth part were placed at the head of each column, it would not be difficult to take out the arc. I have had to enter minutes thus on my book, and find it easy to read; thus, $4586''$ stand in a column headed $76'$. The last figure of the seconds is 6, and as it is in the third group of ten, the arc is $76'-26''$. It would not be necessary to head with the number of minutes, however, if the following suggestions were adopted :—

The running heading of constants in each page seems to me of very little use. Suppose a column contains n' to $(n+1)'$, then I would give as the headings (in the two column pages) :—

$\sin n'$	$\sin (n+1)'$	$\sin (n+2)'$
$\sin n'$	$\sin (n+1)'$	$\sin (n+2)'$
$60\ n$	$60\ (n+1)$	$60\ (n+2)$
$\tan n'$	$\tan (n+1)'$	$\tan (n+2)'$
$\tan n'$	$\tan (n+1)'$	$\tan (n+2)'$
$60\ n$	$60\ (n+1)$	$60\ (n+2)$.

It would be seen that the left-hand column was n', and the right $(n+1)'$, and it would be easy to get the circular functions from the arcs, or the latter from the former up to $3°\ 20'$ without more than one opening of the page, except when arcs under $18'$ were wanted to several places of decimals.

I do not think that the logs. in the first or last columns of the heading are of much use ordinarily, and of those in the middle one I would remove log. 3^{h}.

I have used the antilogarithms a good deal, but it is convenient to have the logarithms of numbers and those of circular functions in one volume, and I doubt if the inconvenience caused by the bulk of this table is not more than any gain from it. The other Tables from III. to XI. I would relegate to a book of special Tables. The only exception would be, I think, a part of Table VI. for obtaining hyperbolic logs from common ones, as

the former are often required in analysis. I do not think Shortrede's form of Gaussian logarithm convenient, and generally, I think, they would not be extensive enough.

I see little that could be done to the Table of Circular Functions. The extending it to the whole circle, and adding time arguments is a great convenience, and the only change I can think of as desirable is the extending the proportional parts for time, but the space seems to forbid.

The Table of Constants should be revised. With the change I have proposed in the running headings of the logs of numbers there would be no need for the columns $\frac{\sin}{\text{arc}}$ and $\frac{\tan}{\text{arc}}$. A great many of the constants might be dispensed with, and fifteen and thirteen places in the logs are quite needless. All the numbers should be carefully revised, and in selecting new ones I would avoid local numbers. Thus, gravity is given at Greenwich which is natural for an Englishman, though English physicists seem to refer now a great deal to Paris; but it would be preferable to give gravity at the Equator or Pole with the formula for correcting it, and the necessary logarithms. Many more constants and their logarithms could be added, even in one page, I think, if these changes were made. But the page should be much less crowded than at present, and the constants should be divided into groups, each with a conspicuous heading. Lastly, a few pages of good paper, for constants required by the owner in his pursuits, might be added with advantage.

I have long thought that 10-figure logarithms were wanted, both of numbers and circular functions; but I see no chance of such tables paying, for many a long day. They would only be used in particular cases.

I think in all computations where they are required it is impossible for a computer not to feel the enormous disadvantage of our mode of dividing the day and the circle. I have a strong feeling myself that the day and the circumference would be most conveniently decimally divided. I would make the difference of successive arguments in the Table of Circular Functions $\frac{1}{1000000}$ of the circumference. Ordinary men and their calculations would not be affected, and perhaps by the time they have advanced to 10-figure tables they will have got to appreciate decimal division. It would be easy to use the MS. French Tables to compare with any published on this system.

Note on observing Lunar Zenith-Distances for Longitude.
By Colonel Tennant.

The only rules I have ever seen for observing lunar zenith-distances for longitude are, first, that given by the Astronomer

c